DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4, 6-13, 18-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hajjahmad et al. (Hajjahmad) (US 5,748,770) in view of Accad (US 5,553,200).

Regarding claim 1:

Hajjahmad discloses a method (e.g., the invention relates to a system and methods thereto for image color recovery, column 1, lines 21-22, figure 1) comprising: scanning an image with a scanner to obtain a full color level of a color element of a pixel of the scanned image (e.g., FIG. 1 illustrates an electronic image processing system where an image signal source, such as an electronic still camera 10 or a scanner 12, provides an electronic image signal which represents an image of the subject, column 4, lines 2-6); composing a pattern (e.g., fig. 4 with vertical red, vertical green, vertical blue , horizontal red, horizontal green, horizontal blue. Note: since pattern is consisting of horizontal and vertical color component. Thus the vertical and horizontal of red, green,

and blue of fig. 4 represent as pattern) comprising the color element (e.g., red, green, blue, figure 4), wherein the pattern has less color level of the color element than the full color level (e.g., from step 404 to step 414, figure 4, column 10, lines 22-39. Note: recovery color level by row and column representing array/halftone pattern; and since the recovery color components red, green, and blue combine for output image with full resolution, column 10, lines 35-39. Thus pattern must have less color level than the full color level); and restoring the full color level of the color element of the pixel by combining the reduced color level image with the pattern, wherein the full color level of the color element is restored without reintroducing the image noise into the scanned image (e.g., the results of the parallel color recovery for each channel are combined in block 416 so that each color component is represented at each pixel location and the output image drawn from the processed pixels will exhibit full color resolution, column 10, lines 22-39. Note: since the processed pixels will exhibit full color resolution. Thus the color element is restored without reintroduced the image noise into the scanned image).

Hajjahmad does not explicitly disclose decreasing the full color level of the color element by reducing a number of bits of the full color level of the color element to form a reduced color level image, and wherein decreasing the full color level causes the image noise to be substantially removed from scanned image, wherein the number of bits reduced from the full color level corresponds to an image noise level associated with scanning the image.

Accad discloses decreasing the full color level of the color element by reducing a number of bits of the full color level of the color element to form a reduced color level image (e.g., the transformed image data is then pixel-wise thresholded using a dither array so that the image data is reduced to a smaller number of bits per pixel per component, for example to 4 or 2 bits per pixel per component, column 8, lines 4-9), wherein the number of bits reduced from the full color level corresponds to an image noise level associated with scanning the image (e.g., it is also desirable to perform bit-rate reduction on a single pixel basis, discarding any spatial compression (noise). It is also desirable to have improved reconstruction techniques that operate on the reduced bit-rate image, maintaining the full intensity resolution of the original image, column 6, lines 49-53. Note: since the bit-rate reduction on a single pixel basis, discarding any spatial compression (noise) and each pixel using a dither array so that the image data is reduced to smaller number of bits (e.g., 4 or 2 bits per pixel. Thus the number of bits reduced from the full color level corresponds to an image noise level associated with scanning the image).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad to include decreasing the color level of the color element by reducing a number of bits of a full color level of the color element to form a reduced color level image, wherein the number of bits reduced from the full color level corresponds to an image noise level associated with scanning the image as taught by Accad. . It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad by the teaching of Accad to have improved

reconstruction techniques that operate on the reduced bit-rate image, maintaining the full intensity resolution of the original image while significantly reducing the processing time required to generate image data for rendering, Accad, column 6, lines 49-53.

Regarding claim 2, Hajjahmad does not explicitly disclose wherein the reduced color level image and the pattern are combined using a bit enhanced method.

Accad discloses wherein the reduced color level image and the pattern are combined using a bit enhanced method (e.g., It is also desirable to have improved reconstruction methods to incorporate into any bit-rate reduction techniques that uses dither arrays, column 6, lines 56-62).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad to include wherein the reduced color level image and the pattern are combined using a bit enhanced method as taught by Accad. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad by the teaching of Accad to have improved reconstruction methods to incorporate into any bit-rate reduction techniques that uses dither arrays.

Regarding claim 3, Hajjahmad differs from claim 3 in that he does not explicitly disclose wherein combining the reduced color level image with the pattern restores the pixel to include a same number of bits of the color element as before the full color level was decreased.

Accad discloses wherein combining the reduced color level image with the pattern restores the pixel to include a same number of bits of the color element as before the full color level was decreased (e.g., a method and apparatus for performing

bit-rate reduction and reconstruction of image data using a dither array is disclosed, column 19, lines 65-67. Note: since each pixel is scanned, a lookup table is used to de-dither, dequantize and inversely transform the image information to produce N' bits per pixel per component of reconstructed image data, where N' is the number of bits required by the rendering device to render the data (e.g., for the Canon CLC 500, N'=N=8 bits per pixel per component for a 32-bit reconstructed image to be printed, column 8, lines 16-22. Thus combining the reduced color level image with the pattern restores the pixel to include a same number of bits of the color element as before the full color level was decreased).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad to include wherein combining the reduced color level image with the pattern restores the pixel to include a same number of bits of the color element as before the full color level was decreased as taught by Accad. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad by the teaching of Accad to reconstruct full color image.

With regard to claim 4, Hajjahmad discloses wherein the pattern comprises a halftone pattern (e.g., FIG. 3A provides the following example of vertical color recovery followed by horizontal color recovery (i.e. column followed by row) for serial implementation of the third color recovery method listed above. An input image s(j,i) having P rows and Q columns is shown in block 300, where i is the row index and j is the column index, column 9, lines 62-65).

Regarding claim 6, Hajjahmad discloses a method for reducing image noise in a scanned image (e.g., FIG. 1 illustrates an electronic image processing system where an image signal source, such as an electronic still camera 10 or a scanner 12, provides an electronic image signal which represents an image of the subject (not shown). A computer 18 receives the electronic signal from the image signal source and thereafter processes the image signal electronically to provide any number of known image processing functions such as resizing, sharpening, noise removal, column 4, lines 2-10), comprising: scanning the image with a scanner to obtain a gray scale of one or more pixels of the image (e.g., FIG. 1 illustrates an electronic image processing system where an image signal source, such as an electronic still camera 10 or a scanner 12, provides an electronic image signal which represents an image of the subject, column 4, lines 2-6); restoring the gray scale of the one or more pixels using a halftone pattern comprising a matrix, and wherein a number of rows and a number of columns of the matrix correspond to the number of bits of gray scale image data subtracted from the one or more pixels (e.g., from step 404 to step 416, figure 4, column 10, lines 22-39. Note: recovery color level by row and column representing array/halftone pattern. Note: since Hajjahmad discloses restoring the gray scale of the one or more pixels using a halftone pattern comprising a matrix. it would have been obvious to one of ordinary skill in the art that to restore and obtain a full level of color image, Hajjahmad must use pattern with row and column equal to number of bits reduced to have full level of color); wherein the full color level of the color element is restored without reintroducing the image noise into the scanned image (e.g., the results of the parallel color recovery for each channel are

combined in block 416 so that each color component is represented at each pixel location and the output image drawn from the processed pixels will exhibit full color resolution, column 10, lines 22-39. Note: since the processed pixels will exhibit full color resolution. Thus the color element is restored without reintroduced the image noise into the scanned image).

Hajjahmad does not explicitly disclose decreasing the full color level of the color element by reducing a number of bits of the full color level of the color element to form a reduced color level image, and wherein decreasing the full color level causes the image noise to be substantially removed from scanned image, wherein the number of bits reduced from the full color level corresponds to an image noise level associated with scanning the image.

Accad discloses decreasing the full color level of the color element by reducing a number of bits of the full color level of the color element to form a reduced color level image (e.g., the transformed image data is then pixel-wise thresholded using a dither array so that the image data is reduced to a smaller number of bits per pixel per component, for example to 4 or 2 bits per pixel per component, column 8, lines 4-9), wherein the number of bits reduced from the full color level corresponds to an image noise level associated with scanning the image (e.g., it is also desirable to perform bit-rate reduction on a single pixel basis, discarding any spatial compression (noise). It is also desirable to have improved reconstruction techniques that operate on the reduced bit-rate image, maintaining the full intensity resolution of the original image, column 6, lines 49-53. Note: since the bit-rate reduction on a single pixel basis, discarding any

spatial compression (noise) and each pixel using a dither array so that the image data is reduced to smaller number of bits (e.g., 4 or 2 bits per pixel. Thus the number of bits reduced from the full color level corresponds to an image noise level associated with scanning the image).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad to include decreasing the color level of the color element by reducing a number of bits of a full color level of the color element to form a reduced color level image, wherein the number of bits reduced from the full color level corresponds to an image noise level associated with scanning the image as taught by Accad. . It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad by the teaching of Accad to have improved reconstruction techniques that operate on the reduced bit-rate image, maintaining the full intensity resolution of the original image while significantly reducing the processing time required to generate image data for rendering, Accad, column 6, lines 49-53.

With regard to claim 7, Hajjahmad differs from claim 7, in that he does not explicitly teach the color level of the pattern depends on the number of bits reduced from the full color level.

Accad discloses the color level of the pattern depends on the number of bits reduced from the full color level (e.g., a method and apparatus for performing bit-rate reduction and reconstruction of image data using a dither array is disclosed, column 19, lines 65-67).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad to include the color level of the pattern depends on the number of bits reduced from the full color level as taught by Accad. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad by the teaching of Accad to have improved reconstruction techniques that operate on the reduced bit-rate image, maintaining the full intensity resolution of the original image while significantly reducing the processing time required to generate image data for rendering, Accad, column 6, lines 49-53.

Regarding claim 8, Hajjahmad discloses a method for reducing image noise in a scanned image (e.g., FIG. 1 illustrates an electronic image processing system where an image signal source, such as an electronic still camera 10 or a scanner 12, provides an electronic image signal which represents an image of the subject (not shown). A computer 18 receives the electronic signal from the image signal source and thereafter processes the image signal electronically to provide any number of known image processing functions such as resizing, sharpening, noise removal, column 4, lines 2-10), comprising: scanning with a scanner to obtain a color level of a color element of a pixel of the scanned image (e.g., FIG. 1 illustrates an electronic image processing system where an image signal source, such as an electronic still camera 10 or a scanner 12, provides an electronic image signal which represents an image of the subject, column 4, lines 2-6); composing a halftone pattern comprising a reduced image level of the color element corresponding to the decreased number of bits; and restoring an image level of the color element of the pixel using the halftone pattern (e.g., from step 404 to step 416,

figure 4, column 10, lines 22-39. Note: recovery color level by row and column representing array/halftone pattern. Note: since Hajjahmad discloses restoring the color level of the one or more pixels using a halftone pattern comprising a matrix. it would have been obvious to one of ordinary skill in the art that to restore and obtain a full level of color image, Hajjahmad must use pattern with row and column equal to number of bits reduced to have full level of color).

Hajjahmad does not explicitly disclose reducing the full image level of the color element by decreasing a number of bits of the color element according to the image noise associated with scanning the image.

Accad discloses reducing the full image level of the color element by decreasing a number of bits of the color element according to the image noise associated with scanning the image (e.g., it is also desirable to perform bit-rate reduction on a single pixel basis, discarding any spatial compression (noise), column 6, lines 47-49).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad to include reducing the full image level of the color element by decreasing a number of bits of the color element according to the image noise associated with scanning the image as taught by Accad. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad by the teaching of Accad Accad to have improved reconstruction techniques that operate on the reduced bit-rate image, maintaining the full intensity resolution of the original image while significantly reducing the processing time required to generate image data for rendering, Accad, column 6, lines 49-53.

With regard to claim 9, Hajjahmad discloses wherein a number of bits of the color element in the recombined image level is the same as a number of bits of the color element in the full image level (e.g., from step 404 to step 416, figure 4, column 10, lines 22-39. Note: recovery color level by row and column representing array/halftone pattern. Note: since Hajjahmad discloses restoring the gray scale of the one or more pixels using a halftone pattern comprising a matrix. it would have been obvious to one of ordinary skill in the art that to restore and obtain a full level of color image, Hajjahmad must use pattern with row and column equal to number of bits reduced to have full level of color).

With regard to claim 10, Hajjahmad discloses wherein the halftone pattern comprises a matrix having a number of rows equal to the decreased number of bits (e.g., from step 404 to step 416, figure 4, column 10, lines 22-39. Note: recovery color level by row and column representing array/halftone pattern. Note: since Hajjahmad discloses restoring the gray scale of the one or more pixels using a halftone pattern comprising a matrix. it would have been obvious to one of ordinary skill in the art that to restore and obtain a full level of color image, Hajjahmad must use pattern with row and column equal to number of bits reduced to have full level of color).

With regard to claim 11, Hajjahmad discloses wherein the halftone pattern comprises a matrix having a number of columns equal to the decreased number of bits (e.g., from step 404 to step 416, figure 4, column 10, lines 22-39. Note: recovery color level by row and column representing array/halftone pattern. Note: since Hajjahmad discloses restoring the gray scale of the one or more pixels using a halftone pattern

comprising a matrix. it would have been obvious to one of ordinary skill in the art that to restore and obtain a full level of color image, Hajjahmad must use pattern with row and column equal to number of bits reduced to have full level of color).

With regard to claim 12, Hajjahmad discloses further comprising displaying the image including the recombined image level on a computer monitor (e.g., while in electronic form, images can be enhanced to create special visual effects, restored, coded for transmission to distant locations, stored in memory (such as on CDROM, DAT, floppy disks, etc.), reconstructed, displayed, or converted to some other tangible form, column 1, lines 36-41).

With regard to claim 13, Hajjahmad does not disclose further comprising filling out missing codes of the pixel using a bit-enhanced method.

Accad discloses further comprising filling out missing codes of the pixel using a bit-enhanced method (e.g., It is also desirable to have improved reconstruction methods to incorporate into any bit-rate reduction techniques that uses dither arrays, column 6, lines 56-62).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad to include further comprising filling out missing codes of the pixel using a bit-enhanced method as taught by Accad. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad by the teaching of Accad to have improved reconstruction methods to incorporate into any bit-rate reduction techniques that uses dither arrays.

Referring to claim 18:

Claim 18 is the apparatus claim corresponding with method steps in claim 8. Therefore claim 18 is rejected as set forth above for claim 8.

Referring to claim 19:

Claim 19 is the apparatus claim corresponding with method steps in claim 9. Therefore claim 19 is rejected as set forth above for claim 9.

With regard to claim 20, the subject matter is similar to claims 10 and 11. Therefore claim 20 is rejected as set forth above for claims 10 and 11.

Regarding claim 21, Hajjahmad discloses wherein the image level is recombined with the halftone pattern to restore the color element of the one or more pixels to the full image level (e.g., the results of the parallel color recovery for each channel are combined in block 416 so that each color component is represented at each pixel location and the output image drawn from the processed pixels will exhibit full color resolution, column 10, lines 22-39).

Regarding claim 22, Hajjahmad does not explicitly disclose wherein the number of bits decreased from the full image level approximates a level of the image noise.

Accad discloses wherein the number of bits decreased from the full image level approximates a level of the image noise (e.g., the transformed image data is then pixel-wise thresholded using a dither array so that the image data is reduced to a smaller number of bits per pixel per component, for example to 4 or 2 bits per pixel per component. This reduced information is stored in a frame buffer, column 8, lines 4-9; and it is also desirable to perform bit-rate reduction on a single pixel basis, discarding any spatial compression, column 6, lines 47-49. Note: since the image data is reduced

to a smaller number of bits per pixel per component, for example to 4 or 2 bits per pixel per component and also for discarding any spatial compression. Thus the number of bits decreased from the full image level approximates a level of the image noise).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad to include wherein the number of bits decreased from the full image level approximates a level of the image noise as taught by Accad. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad by the teaching of Accad to have improved reconstruction methods to incorporate into any bit-rate reduction techniques that uses dither arrays.

. With regard to claim 23, the subject matter is similar to claim 7. Therefore claim 23 is rejected as set forth above for claim 7.

Regarding claim 24, Hajjahmad discloses wherein one or more of the full image level, the reduced image level, and the image level comprise a color level (e.g., color recovery, Fig. 3A).

Regarding claim 25, Hajjahmad discloses wherein one or more of the full image level, the reduced image level, and the image level comprise a gray level (e.g., The results of the parallel color recovery for each channel are combined in block 416 so that each color component is represented at each pixel location and the output image drawn from the processed pixels will exhibit full color resolution, column 10, lines 35-39. Note: color component represents gray level).

Regarding claim 26, Hajjahmad discloses wherein the scanned image comprises three color elements, and wherein the pixel comprises at least one of the three color elements (e.g., Red, green, and blue in RGB color space, figure 4).

Regarding claim 27, Hajjahmad discloses wherein the three color elements comprise a red color element, a blue color element, and a green color element (e.g., Red, green, and blue in RGB color space, figure 4).

Regarding claim 28, Hajjahmad discloses wherein the full image level of the color element and the recombined image level of the color element comprises a gray level (e.g., The results of the parallel color recovery for each channel are combined in block 416 so that each color component is represented at each pixel location and the output image drawn from the processed pixels will exhibit full color resolution, column 10, lines 35-39).

Regarding 29, Hajjahmad does not explicitly disclose wherein the full image level is reduced by decreasing a number of bits of the gray level.

Accad discloses wherein the full image level is reduced by decreasing a number of bits of the gray level (e.g., the transformed image data is then pixel-wise thresholded using a dither array so that the image data is reduced to a smaller number of bits per pixel per component, for example to 4 or 2 bits per pixel per component. This reduced information is stored in a frame buffer, column 8, lines 4-9).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad to include decreasing the color level of the color element by reducing a number of bits of a full color level of the color element to

form a reduced color level image, wherein the number of bits reduced from the full color level corresponds to an image noise level associated with scanning the image as taught by Accad. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad by the teaching of Accad to have improved reconstruction methods to incorporate into any bit-rate reduction techniques that uses dither arrays.

Regarding 30, Hajjahmad does not explicitly disclose where the number of bits of the color element decreased from the full image level is dependent on a level of the image noise.

Accad discloses where the number of bits of the color element decreased from the full image level is dependent on a level of the image noise (e.g., the transformed image data is then pixel-wise thresholded using a dither array so that the image data is reduced to a smaller number of bits per pixel per component, for example to 4 or 2 bits per pixel per component. This reduced information is stored in a frame buffer, column 8, lines 4-9; and it is also desirable to perform bit-rate reduction on a single pixel basis, discarding any spatial compression, column 6, lines 47-49. Note: since the image data is reduced to a smaller number of bits per pixel per component, for example to 4 or 2 bits per pixel per component and also for discarding any spatial compression. Thus the number of bits decreased from the full image level approximates a level of the image noise).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad to include where the number of bits of the

color element decreased from the full image level is dependent on a level of the image noise as taught by Okada. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Hajjahmad by the teaching of Accad to have improved reconstruction methods to incorporate into any bit-rate reduction techniques that uses dither arrays.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to QUANG N. VO whose telephone number is (571)270-1121. The examiner can normally be reached on 7:30AM-5:00PM Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K. Moore can be reached on (571)272-7437. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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